

**Separate Statement of The Boeing Company
to the Report of the U.S. Advisory Committee
Preparing for WRC-2000**

During the past two years the U.S. Advisory Committee has been working with the international satellite and radiocommunications community to develop technical criteria enabling the launch and operation of a new generation of non-geostationary (“NGSO”) satellite networks capable of providing a wide range of consumer services in the Ku-band.

For the most part, these efforts have been fruitful. It appears that the U.S. Advisory Committee will be supporting technical specifications and interference limits that cover nearly every aspect of NGSO satellite network operations. Adoption of these and other limits by the 2000 World Radiocommunication Conference (“WRC-00”) will enable United States aerospace companies such as Boeing to launch and operate NGSO constellations that will be capable of providing new broadband information and data services to populations and businesses on a global basis.

Despite its successes, the U.S. Advisory Committee has not been entirely successful in completing its work. The United States has failed to reach consensus with the international satellite community on several issues that are critical to the success of NGSO networks in the Ku-band. First, the Advisory Committee is continuing to support EPFD_{down} limits intended to protect two sizes of antennas for geostationary (“GSO”) fixed satellite service (“FSS”) and broadcast satellite service (“BSS”) networks, even though the limits supported by the United States were studied by ITU-R technical committees and did not receive significant endorsement. Furthermore, at least one applicant for a FCC authorization for a NGSO network in the Ku-band has indicated that it would be unable to meet the limits included in the Advisory Committee’s proposal.

The United States has indicated in both international and domestic fora that it will continue to study the issue of appropriate EPFD_{down} limits in an effort to reach a compromise that is acceptable to all administrations. Boeing believes that the United States’ position for WRC-00 should include an endorsement of additional negotiations and a commitment to reaching a final resolution on EPFD_{down} limits prior to WRC-00 that is acceptable to all administrations and NGSO applicants before the FCC.

An equally important issue is adopting reasonable limits needed to protect NGSO satellites from interference caused by GSO earth stations. JTG 4-9-11 concluded during its January meeting in Long Beach, California that in order to protect NGSO satellite systems, off-axis e.i.r.p. limits for GSO earth stations should be included in the ITU Radio Regulations.¹ The need for such limits was first acknowledged by WRC-97, which observed in Resolution 130 that NGSO networks could operate in the Ku-band without “specific protection from existing and

¹ See *Report of the Third Meeting of JTG 4-9-11*, Document 4-9-11/367, § 9.3.1 (19-29 January 1999) (noting that “the aim to have such limits included in the Radio Regulations was to give guidance to the non-GSO systems designers in assessing the maximum interference level they would receive from the earth stations operated with GSO satellites”).

future GSO FSS systems, provided that minimum constraints are applied to GSO FSS systems, such as off-axis earth station e.i.r.p. limits.” (emphasis added). Since the close of WRC-97, the ITU-R has developed off-axis e.i.r.p. limits for GSO networks that are sufficiently lenient to avoid encumbering GSO licensees, while giving NGSO applicants an important level of interference protection that they can use as a baseline in the designs of their systems.

Unfortunately, Informal Working Group 4 (“IWG-4”) failed to endorse a proposal to include these limits in the Radio Regulations. IWG-4 refrained from endorsing this proposal despite the fact that the domestic GSO satellite community has provided no indication that such limits would burden their current operations or future growth. Accordingly, Boeing urges the United States to support the adoption of off-axis e.i.r.p. limits for GSO earth stations in the Ku-band by WRC-00. Appropriate limits that have been endorsed by the ITU-R study process are attached to this statement in the format of a United States proposal.

**ANNEX TO SEPARATE STATEMENT OF
THE BOEING COMPANY**

June 24, 1999

UNITED STATES OF AMERICA

**Off-Axis EIRP Limits to Enable Sharing Between
Non-GSO FSS and GSO FSS in Ku Band**

Issue: Off-Axis EIRP Limits in the Ku band

Agenda Item: 1.13.1

Background Information:

WRC-97 identified frequencies in the Ku-band where NGSO FSS systems would be permitted to operate co-frequency, co-coverage with GSO FSS systems and would not require specific protection from GSO FSS systems, provided that minimum constraints are applied to GSO FSS systems, such as off-axis earth station e.i.r.p limits.

Agenda item 1.13.1 states:

“to review and, if appropriate, revise the power limits appearing in Articles S21 and S22 in relation to the sharing conditions among non-GSO FSS, GSO FSS, GSO broadcasting-satellite service (BSS), space sciences and terrestrial services, to ensure the feasibility of these power limits and that these limits do not impose undue constraints on the development of these systems and services”

United States Position:

JTG 4-9-11 concluded during its January meeting in Long Beach, California that in order to protect NGSO satellite systems, off-axis e.i.r.p. limits for GSO earth stations should be included in the ITU Radio Regulations.² JTG 4-9-11 and WP 4-A developed off-axis e.i.r.p. limits for GSO networks that are sufficiently lenient to avoid encumbering GSO licensees, while giving NGSO applicants an important level of interference protection that they can use as a baseline in the designs of their systems. These limits should replace the suspended limits in Section VI of article S22 of the Radio Regulations. The off-axis e.i.r.p. limits are repeated below.

² See *Report of the Third Meeting of JTG 4-9-11*, Document 4-9-11/367, § 9.3.1 (19-29 January 1999) (noting that “the aim to have such limits included in the Radio Regulations was to give guidance to the non-GSO systems designers in assessing the maximum interference level they would receive from the earth stations operated with GSO satellites”).

MOD S22.26

The level of equivalent isotropically radiated power (e.i.r.p.) emitted by an earth station shall not exceed the following values for any off-axis angle ϕ which is 3° or more off the main-lobe axis of an earth station antenna:

<i>Off-axis angle</i>	<i>Maximum e.i.r.p.</i>
$3^\circ \leq \phi \leq 7^\circ$	$(42 - 25 \log \phi)$ dB(W/40 kHz)
$7^\circ < \phi \leq 9.2^\circ$	21 dB(W/40 kHz)
$9.2^\circ < \phi \leq 48^\circ$	$(45 - 25 \log \phi)$ dB(W/40 kHz)
$48^\circ < \phi \leq 180^\circ$	3 Db(W/40 kHz)

MOD S22.27

For FM-TV emissions with energy dispersal, the limits in No. **S22.26** above may be exceeded by up to 3 dB provided that the off-axis total e.i.r.p. of the transmitted FM-TV carrier does not exceed the following values:

<i>Off-axis angle</i>	<i>Maximum e.i.r.p.</i>
$3^\circ \leq \phi \leq 7^\circ$	$(56 - 25 \log \phi)$ dBW
$7^\circ < \phi \leq 9.2^\circ$	35 dBW
$9.2^\circ < \phi \leq 48^\circ$	$(59 - 25 \log \phi)$ dBW
$48^\circ < \phi \leq 180^\circ$	17 dBW

MOD S22.28

FM-TV carriers which operate without energy dispersal should be modulated at all times with programme material or appropriate test patterns. In this case, the off-axis total e.i.r.p. of the emitted FM-TV carrier shall not exceed the following values:

<i>Off-axis angle</i>	<i>Maximum e.i.r.p.</i>
$3^\circ \leq \phi \leq 7^\circ$	$(56 - 25 \log \phi)$ dBW
$7^\circ < \phi \leq 9.2^\circ$	35 dBW
$9.2^\circ < \phi \leq 48^\circ$	$(59 - 25 \log \phi)$ dBW
$48^\circ < \phi \leq 180^\circ$	17 dBW

These limits do not apply to earth station antennas put into operation at any time and operating with a satellite network in the fixed satellite service for which complete coordination or notification information has been received before 2 June 2000.

Reasons:

Resolution 130 at considering further (h) states “that non-GSO FSS systems have been proposed in some of these bands which could meet these limits and would not require specific protection from existing and future GSO FSS systems, provided that minimum constraints are applied to GSO FSS systems, such as off-axis earth station e.r.i.p limits;” (emphasis added.)

All inter-service and intra-service sharing criteria and constraints are encoded in the Radio Regulations. The off-axis EIRP limits provide spectrum sharing constraints on GSO FSS earth station emissions to limit interference into NGSO FSS satellites. As an intra-service spectrum sharing limit, the off-axis EIRP limits should be incorporated into the Radio Regulations. Without such limits in place, designers of NGSO FSS systems will be unable to determine the levels interference that GSO earth stations may transmit into NGSO satellites.

JTG 4-9-11 concluded during its January meeting in Long Beach, California that in order to protect NGSO satellite systems, off-axis e.i.r.p. limits for GSO earth stations should be included in the ITU Radio Regulations. To this end, JTG 4-9-11 and WP 4-A developed off-axis e.i.r.p. limits for GSO networks that are sufficiently lenient to avoid encumbering GSO licensees, while giving NGSO applicants an important level of interference protection that they can use as a baseline in the designs of their systems.